heart, with intensification during systole and diastole. There were signs of aneurysm of the arch of the aorta. On account of the peculiar cyanosis and rapid onset a diagnosis of aneurysm rupturing into the cava was made. At the autopsy an aneurysm of the ascending portion of the arch was found. The right side of the sac was in connection with the vena cava superior. Careful examination of the vena cava and of the aneurysmal sac failed to show any communication between the two. There was no thrombosis in the vena cava.

The murmur described is simulated by the murmur caused by a rupture between an aneurysm and the pulmonary artery, as proved by cases reported by Clarke[12] and Kaufmann,[13] but in these cases there is not the characteristic cyanosis of the face, head, and chest. Cases are reported of a tumor making gradual pressure on the vena cava in which nearly the same physical signs exist, excepting the murmur. In his case, too, Goldflam[14] says the symptoms came on slowly.

The diagnostic signs, then, of rupture of an aneurysm into the superior cava are: (1) A sudden cyanosis, œdema, and dilatation of the veins of the face, head, neck, arms, and chest. (2) A peculiar, continued, high-pitched murmur, present in about half the cases. (3) The physical signs of an aneurysm of the aorta. A very probable diagnosis of the condition may be made on the first sign alone.

A STUDY OF THE DIFFERENT FORMS OF ALBUMIN OCCURRING IN THE URINE.

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Strictly and correctly speaking the term albuminuria may be limited by some to the excretion of albumins in the urine through the renal tissues; but if the term is considered as applied almost universally it relates to the finding of an albumin in the urine excreted from the bladder. We have accepted the second conception as the basis for this article, which deals with over 5000 examinations of specimens, many of which were sent to the laboratory with the statement that albuminuria was present and with the request to interpret this condition. It has been found that the large majority of medical men recognize but one type of albuminuria—any positive reaction for albumin meaning serum-albuminuria, a view which is erroneous.

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[12] Brit. Med. Journ., 1900, ii, 1701.

[13] Wien. klin. Woch., 1905, xviii, 1004.

[14] Méd. mod., 1892, iii., 416.

ALBUMIN BODIES COMMONLY FOUND IN URINE. If one studies this subject it is found that albumin bodies of endogenous origin which may occur in urine are numerous, including serum-albumin, serum-globulin, fibrinogen, fibrin, nucleo-albumin, nucleo-proteid, mucin, Bence Jones' albumin ("albumose") and the derivatives of albumin, digestive albumose, and true peptone.

In a recent article[1] we have gone at length into the classification of the albumin bodies which might, theoretically, occur in the urine, the albumin bodies which commonly occur in the urine, and the reasons for releasing from consideration certain of these bodies; we have emphasized four of them which should be borne in mind for common-sense reasons—serum-albumin, serum-globulin, nucleo-albumin, Bence Jones' albumin (albumose); and, furthermore, we have given reasons for adopting the following simple methods of differentiation:

The specimens of urine were subjected to four distinct tests: (*a*) Heat and acetic acid for the presence of an albumin body; (*b*) cold acetic acid with diluted urine to prove the presence of nucleo-albumin or mucin; (*c*) heat and acetic acid, after salting with saturated aqueous sodium chloride solution, thus excluding nucleo-albumin and in many instances bringing out a serum-albumin reaction not detected by the first test, on account of the poor neutral-salt content of the urine; (*d*) the test given for serum-globulin.

Out of 5330 specimens, 4068 (76.5 per cent.) showed reactions for albumin by heat and acid, (*a*) or by salting and heat and acid, (*c*) or by both; and it is upon 3089 of these specimens, in which the albumin bodies were carefully separated, that the percentages of different types are based.

METHODS FOR SEPARATING AND RECOGNIZING ALBUMINS.[2]

(*a*) Test-tube two-thirds full of urine:

Heat upper one-third of urine. Cloudiness may be—serum-albumin, nucleo-albumin, serum-globulin: On addition of 2 to 5 drops of 50 per cent. acetic acid and second heating—increased cloud or lessened cloud persisting.

Albumose (Bence Jones), phosphates, carbonates: On addition of 2 to 5 drops of 50 per cent. acetic acid and second heating—disappearance of cloud or partial clearing.

If the reaction is faint ("faint trace")—probably serum-albumin, nucleo-albumin, or both.

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[1] T. W. Hastings, Albuminuria, Medical Record, July 7, 1906, p. 13.

[2] Hastings, Medical Record, July 7, 1906.

(*b*) The presence of nucleo-albumin is tested for by diluting 3 to 5 c.c. of urine with five to six times its volume of distilled water, adding to one-half of this diluted urine 1 to 2 c.c. of 50 per cent. acetic acid cold, not heating; a diffuse cloudiness in the acidulated one-half is probably nucleo-albumin (may be mucin, but mucin will not respond to the first heat and acetic acid test).

(*c*) Nucleo-albumin is not precipitated by heat and acid in highly "salted" urines, and, therefore, saturated aqueous solution (30 per cent.) of sodium chloride is used to prove the presence of serum-albumin.

To the urine add one-fifth volume of saturated sodium chloride solution, heat the upper one-third, add 2 to 5 drops of 50 per cent. acetic acid, and heat a second time; a persistent cloud is serum-albumin (may be with serum-globulin).

If a massive reaction, there is usually serum-albumin with serum-globulin; may be Bence Jones' albumin ("albumose") or serum-albumin alone or with fibrinogen.

To separate serum-globulin and albumose (Bence Jones' albumin), to the urine add one-fifth volume of saturated sodium chloride solution and 2 to 5 drops of 50 per cent. acetic acid, with or without heating. Cloudiness may be serum-globulin, albumose (Bence Jones' albumin), or, rarely, serum-albumin alone.

Heat the upper one-third. A heavy cloud followed by partial clearing suggests albumose (Bence-Jones). A persisting cloud is serum-globulin or serum-albumin, or both.

Boil the entire tube and filter. A heavy cloud reappearing in the filtrate on cooling is albumose (Bence-Jones' albumin). A faint reaction on cooling, due to deutero-albumose, often appears; this has practically no clinical value.

(*d*) For serum-globulin:

To a test-tube of distilled water add urine drop by drop to 8 to 10 drops, no heating. A cloud (cold) means serum-globulin, which clears after addition of 2 to 5 drops of 50 per cent. acetic acid (cold).

It is sufficient to state that such methods depend upon the properties of the different albumins, whereby they react differently to heat and to acids in solution, free from or possessing a low content of neutral salts, and containing large amounts of neutral salts, properties well known to physiological chemists and not sufficiently noted by the physician. Practical illustration of the results obtained by such methods is seen in these urine examinations in five cases of lobar pneumonia. (See Table I.)

There is only one chance for confusion, that of mucin with nucleo-albumin, since both react in dilute solutions poor in neutral salts to an excess of acetic acid in the cold. Mucin, however, does not react to heat and acetic acid as does nucleo-albumin in urines ordinarily; and when the first test without salting is positive and the second test with salting is negative, the nucleo-albumin is certainly present and may react in dilute solution after the addition of cold acetic acid.

TABLE I.

PNEUMONIA CASES.

	Test *a*.	Test *b*.	Test *c*.	Test *d*.	NaCl per cent.	Amt. c.c.	Sp.gr.	Casts.
CASE I.								
Jan. 24	+	0	+++	0	0.68	....	1016	0
25	+	0	++	0	0.5	....	1020	H+G
26	+	0	+	0	1.2	400	1018	H+G
27	+	+	++	0	0.5	800	1027	H
29	+++	0	+++	+	0.6	1250	1022	H+G
30	+	0	++	0	0.5	800	1025	H+G
31	+	0	++	0	0.45	420	1026	H
CASE II.								
Jan. 25	+	0	++	+	0.85	1600	1015	H+G
26	+	+	0	0	1.05	2400	1010	0
27	+	0	+	0	0.75	2000	1005	0
29	+	0	+	0	0.75	2450	1006	0
30	+	0	+	0	1.45	1300	1015	0
Feb. 1	0	0	0	0	0.9	2500	1010	0
4	+	0	+	0	0.48	1300	1016	0
CASE III.								
Feb. 15	++	+	+++	0	0.3	800	1016	H+G
16	++	+	+++	0	0.2	1000	1016	H+G
17	+	+	++	0	0.5	400	1018	H+G
19	++	+	++	0	...	500	1014	H+G
20	+	+	++	0	0.2	600	1014	H
21	++	+	+++	0	0.3	1080	1014	H+G
CASE IV.								
Jan. 24	++	0	+++	+	0.63	1380	1018	H+G
26	+	+	+	0	0.85	1000	1016	H+G+E
27	+	+	+++	+	0.15	1800	1014	H+G
29	+	0	++	0	0.15	750	1012	H
30	+	0	+	0	0.2	1300	1015	H
Feb. 1	+	0	++	0	0.25	2400	1016	—
4	+	0	+	0	0.62	700	1020	H
6	++	0	++	0	0.74	1000	1018	H+G
7	++	0	++	+	0.8	900	1020	H+G
CASE V.								
Feb. 3	+	0	+	0	0.13	400	1025	0
6	+	+	0	0	0.7	560	1022	0
8	+	+	++	0	0.34	800	1026	0
9	+	++	+	0	0.34	520	1022	0
10	+	++	0	0	0.5	520	1026	0
12	0	0	0	0	0.95	....	1015	0
15	+	+	0	0	0.75	980	1015	0
17	++	++	+	0	0.55	1180	1014	H
19	+	+	+	0	0.85	2000	1014	H
20	+	+	+	0	0.95	1200	1016	H
24	+	+	0	0	1.00	....	1020	0

+ = faint reaction.
++ = marked reaction.
+++ = massive reaction.

H = hyaline casts.
G = granular casts.
E = epithelial casts.

Among the figures following there is no question concerning those for "nucleo-albumin" alone but under those for "nucleo-albumin and serum-albumin" the nucleo-albumin reaction (cold) may have been due in some instances to mucin, and yet we class the reactions as for nucleo-albumin, since mucin is very rarely present in sufficient amount to respond to any test when small amounts of urine are used, excepting in gross infectious conditions usually below the ureters, and in infectious conditions one finds nucleo-albumin as well as mucin, serum-albumin, and possibly serum-globulin. According to Dr. Hoobler's analyses of 1988 specimens, giving one test for albumin, mucin occurred in 349 (17.5 per cent.); but when one uses the heat and acetic acid test mucin does not respond, and it need not, therefore, be considered from a practical standpoint. In three cases only have we been able to isolate mucin and recognize it as such by splitting with mineral acids and obtaining a reducing body from the twenty-four-hour urine output.

As mentioned in the former article referred to, serum-globulin need not be considered apart from serum-albumin, since in these 3089 specimens of albuminuria it occurred in but 5.6 per cent., never alone, and always with serum-albumin; its occurrence was about equally distributed between cases of acute hemorrhagic or parenchymatous nephritis, hematuria, or infection either renal or below the ureters in the bladder or prostate.

Fibrinogen or fibrin occurred in nine specimens from 3 cases, one case of filarial hematuria and two cases of profuse hematuria.

NECESSITY FOR SEPARATING SERUM-ALBUMIN AND NUCLEO-ALBUMIN. The necessity for separating serum-albumin and nucleo-albumin arises when the reaction is faint, since both respond alike to the simpler tests, and serum-albumin has a definite significance, while nucleo-albumin, as far as we know, is of relatively little import, unless possibly indicating the conditions coming under the term "irritation." It is a fact that nucleo-albumin is not commonly present in the urine of chronic nephritis, while it is, as a rule, found in the urine of acute nephritis and subacute nephritis and in inflammatory conditions of the genitourinary tract below the kidney.

In our 3089 urine examinations nucleo-albumin alone was found in 839 (26.5 per cent.) of the specimens. (See Table II.) We have welcomed such positive reaction without serum-albumin in cases of pregnancy and in operative cases in which the kidney to be left behind was thought guilty of a faint albuminuria, particularly, and also in cases of suspected nephritis. With us the commonest occurrence and source of this trace of nucleo-albumin is in the male and from chronic urethral and prostatic conditions. In one case of hydronephrosis with operation its source was undoubtedly renal, and it was the only albumin body present in the fluid from a large non-infected sac, involving a large portion of the renal parenchyma. Whether or not this was a renal nucleo-proteid we were not prepared to prove. In this one case only have we been able to prove absolutely, however, a renal origin for the nucleo-albumin reactions, although it probably not infrequently exists; of the not uncommon prostatic origin we are certain.

The higher percentage of albuminurias in the hospital cases as compared with dispensary cases is striking, and is probably explained by the facts that among the former many were postoperative, and the specimens from nephritic cases were usually examined daily and the non-nephritic weekly.

The discrepancies between the reactions brought out by salting (10, Table II) and between the occurrences of nucleo-albumin (11, Table II) in the hospital and dispensary cases are undoubtedly due to the relatively frequent occurrence of a normal neutral salt content and of nucleo-albumin in the acute and subacute nephritic conditions with infectious diseases and in acute nephritis (hospital cases), and to the relatively infrequent occurrence of a normal neutral-salt content and of nucleo-albumin in chronic nephritis (dispensary cases).

TABLE II.

	D. Mixed Dispens.		H. Hospital.		D.+H.
	specimens.	Per cent.	Specimens.	Per cent.	Average per cent.
1. No albuminuria	750	26.5	512	20.5	23.5
2. Total albuminurias	2080	73.5	1988	79.5	76.5
3. Albumin separated.	1101	—	1988	—	(3089.)
Albumin, type not noted.	979	—	0	—	(979.)
4. Nucleo-albumin alone.	269	24.4	570	28.6	26.5
5. Serum-albumin, no nucleo-albumin . .	344	31.2	176	8.8	20.
6. Serum-albumin + nucleo-albumin . .	488	44.3	1202	60.4	52.4
7. Albumose (Bence-Jones' albumin) . .	0	0	0	0	0
8. Serum-albumin + serum-globulin . .	62	5.6	—	—	
9. Serum-albumin + fibrinogen or fibrin. (3 cases)	9	0.81	0	0	0.81
10. Nucleo-albuminalone or + serum-albumin	757	68.7	1696	85.3	77.
11. Serum-albumin with or without nucleo-albumin	832	75.5	1418	71.3	73.4
12. Reaction after salting only	308	27.9	40	0.21	14.

The necessity for using some such method as salting, heating, and acetic acid (c) to bring out or intensify albumin reactions for serum-albumin in urine poor in neutral salts is shown by the fact that 348 specimens (14 per cent.) of the albuminurias reacted distinctly and often markedly after salting only and responded to no other test as well as by the urines from pneumonia cases. Of these specimens many were from 25 nephritic cases, 20 per cent. of the total number of cases of nephritis.

ALBUMINURIA IN CASES WITH CLINICAL DIAGNOSIS OF NEPHRITIS. We do not refer here to those cases of contagious, infectious, metabolic, and toxic conditions which show a disturbance of renal function and probably a transient nephritis, nearly all of which conditions show serum-albuminuria with casts, some of them serum albuminuria without casts when tested with salt solution, heat, and acetic acid, but to cases of well-established Bright's disease in which the first suggestion of the renal condition comes from the symptoms and physical signs.

In proportion to the total number of cases showing albuminuria, 1014, the percentage is small, 12.59 per cent.

As mentioned before, the chronic cases gave no nucleo-albumin-mucin reaction as did the more acute cases. Most important is the fact that many of the chronic interstitial cases, with large amounts of low specific gravity urine, gave no positive tests until the urine had been salted, tested with heat and acetic acid, and allowed to stand for from five to ten minutes.

What we wish to emphasize are the discrepancies between the total cases of serum-albuminuria (1014), the number of cases showing serum-albumin and casts (474), and the number of cases clinically nephritis (125). (See Table III.)

TABLE III.

	Cases.				
	Dispensary.	Per cent.	Hospital.	Per cent.	Per cent.
Albuminuria (=serum-albumin), no casts, clinical diagnosis nephritis	1	0.098	2	0.196	0.29
" " +casts.	104	10.2	21	2.1	12.3
Nephritis=128 cases	105		23		12.59
Albuminuria (=serum-albumin) no casts, clinical diagnosis not nephritis	447	44.	90	8.99	52.9
" " +casts.	174	17.19	175	17.3	34.4
Total cases of albuminuria (=serum-albumin) in 5330 urines	726	71.8	288	28.	100.
Total cases of albuminuria (=serum-albumin), +casts	278	27.4	196	19.3	46.7
No albumin-bodies = clinical diagnosis nephritis	1 exam. 1 visit.		0		0
Nucleo-albumin alone=clinical diagnosis nephritis	0		0		0

Albuminuria does not necessarily, nor does it usually, indicate nephritis, a fact more generally recognized by the genitourinary surgeon than the general practitioner; but it may be indicative of nephritis, and, therefore, cannot be disregarded in diagnosis. From our cases it would seem that albuminuria *with casts* is good evidence of nephritis either temporary, as in the majority of diseases, or permanent in the conditions showing the other evidences (cardiac, circulatory, digestive, cerebral) of Bright's disease.

In no instance has nucleo-albuminuria alone occurred in a case which suggested in any way nephritis.

In only one instance has serum-albumin been absent in a case with the clinical diagnosis of nephritis, in which case but one specimen was examined and the patient was seen but once. In several cases the albuminuria had disappeared entirely after several days or weeks of treatment, during which period the signs and symptoms improved markedly.

Such evidence may suffice for the practitioner, but does not satisfy those of us who look to postmortem evidence as final; for this we refer to the meagre evidence presented by the cases to be published later, which coincide with the clinical evidence.

In only one case and in one specimen was nucleo-albumin found alone with hyaline casts; and in only two cases and two specimens was "no albumin" found with hyaline casts. These observations were made by the same individual. Such occurrences in 5000 specimens of urine do not furnish evidence of value.

We would state, in conclusion, that this material, coming from variedly mixed services—medical, surgical, gynecological, and numerous dispensary departments—gives a fair idea of the average occurrence of albuminuria in practice. We would emphasize the frequency of non-renal albuminuria and the occurrence of nucleoalbuminuria alone in a large percentage of cases; and would recommend the addition of saturated salt solution with subsequent heating and acidifying with acetic acid as the safest test for serum-albumin. In practice, the separation of the albumin bodies is unnecessary.

We extend our thanks to Dr. Thacher, of the Presbyterian Hospital, for placing at our disposal much of the material studied.

THE PATHOLOGY AND TREATMENT OF NEPHRITIS.

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The kidney stands in very intimate relation to all the other organs of the body and has a twofold function of excretion and secretion. Placed as it is, at the point where the metabolic products of the system may be thrown off or held back according to their nature and their properties of being useful or useless in the further activities of the body, the kidney, with unerring accuracy, quickly excretes those substances which have outlived their usefulness in the economy and holds back those which have further value. In other words, this organ, being the osmo-regulator of the blood and, consequently, the regulator of the composition and concentration of this tissue, shows almost intelligent power of excretion.

It is worth while bearing in mind the fact that an exceedingly close relationship exists between blood supply and functional activity, an instance of which is the numerous capillary tufts shoved into the beginning of the tortuous secreting tubules. An additional point of value, however, is that the afferent artery, which breaks up into the capillary tuft, has a greater caliber than the efferent vein leading from the tuft. It is, therefore, easier for blood to reach the glomerulus than to leave it, inasmuch as the pressure in the capillary tuft is greater than in ordinary capillaries owing to the resistance in the narrow efferent vein and its capillary plexus. This double capillary supply, both on entering and on leaving the glomerulus, seems to suggest the idea that the highly organized part of the renal tubules is protected from excessive blood pressure by the interposition of the glomerulus as a block.

I shall not discuss the facts, pro and con, leading to the assumption of our present theory of renal secretion further than to state that the water, salts, and probably the pathological sugar and albumin